

INVERSION OF FOREST PARAMETERS USING AN OPTIMIZATION TECHNIQUE AND PARAMETRIC MODELS

Mahta Moghaddam
Jet Propulsion Laboratory, California Institute of Technology
4800 Oak Grove Drive
Pasadena, CA 91109
Phone: (818) 354-1591, Fax: (818) 393-0943

The application of an inversion algorithm based on a nonlinear optimization technique to retrieve forest parameters is discussed. The data to be used are C-, L-, and P-band polarimetric airborne SAR backscatter measurements. The inversion algorithm is an iterative procedure and requires a priori estimates of the unknowns as well as knowledge of the stochastic properties of measured data. Parametric models are used to relate the unknowns describing forest physical parameters to SAR data. These models are obtained through Monte Carlo simulations of a numerical forest scattering model developed at JPL, where many data points are generated by varying the model parameters over specified ranges. One- and two-parameter models are then derived from the database, i.e., models where one or two of the parameters are allowed to vary, assuming all other parameters are known. The inversion algorithm is tested and verified by using synthetic data initially. It is then applied to SAR data from the Canadian Boreal forest obtained over several Jack Pine stands, and the results are compared to ground-truth measurements. The results are in good proximity of the actual values, although it is observed that as the number of unknown parameters increases, the accuracy of inversion decreases.

This work was performed by the Jet Propulsion Laboratory, California Institute of Technology, under contract from the National Aeronautics and Space Administration.